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INTRA-AMPHIBIOUS TASK FORCE COMMUNICATIONS.
BRIDGING THE CAPABILITIES/REQUIREMENTS "GAP."
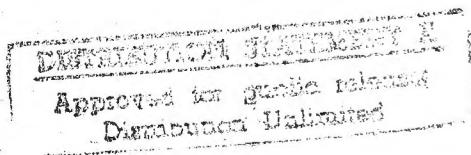

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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15. Abstract: This paper proposes a solution to current amphibious communications shortfalls. Specifically, it focuses on the need for a high capacity communications pipe to facilitate high-data-rate information transfer between amphibious task force ships, and between amphibious ships and landing force elements phased ashore during amphibious operations. The author examines current shortfalls in this area, and explains why these shortfalls can no longer be ignored. He recommends fielding shipboard terrestrial multichannel radio systems on amphibious ships to supplement satellite communications methods and bridge the "gap" between current communications capabilities and requirements.

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From the amphibious operations of World War II to the present
day, U.S. amphibious forces have been placed in the unenviable
position of conducting one of the most complex of military
operations -- amphibious assaults, with inadequate shipboard
communications support. Historically, amphibious shipboard
communication capabilities have always fallen far short of
commanders' requirements. While past amphibious commanders have
made due, and succeeded despite "gaps" between shipboard
communication capabilities and requirements, this situation can
no longer be tolerated.

The purpose of this paper is to bridge two of the most
significant of these communications capabilities/requirements
"gaps" by proposing a means of improving intra-Amphibious Task
Force (ATF) communications. Specifically, my focus will be on
fulfilling the high-data-rate intra-ATF communications
requirements that have evolved as a result of the "explosion" of
new information technologies and consequent reliance on automated
command and control, intelligence, and data processing systems.
I will examine current shortfalls in this area, explain why we
can no longer ignore these shortfalls, and propose that we solve
them by providing each ship and landing force headquarters
element of the amphibious task force with a terrestrial (non-
satellite) high-data-rate multichannel radio capability. Given
current multichannel radio technology, reliable ship-to-ship and
ship-to-shore intra-ATF communications via multichannel radio is
now a realistic option. Such a solution will also favorably

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impact theater-wide communications by reducing the ATF's
dependence on satellite communications (SATCOM), thereby freeing
up scarce satellite communications channels for use by other
organizations in theater.

THE STATUS OF POST—COLD WAR AMPHIBIOUS COMMUNICATIONS AND TODAY'S INTRA—AMPHIBIOUS TASK FORCE COMMUNICATIONS SHORTFALLS

The communications requirements of an Amphibious Task Force
can be divided into two broad categories: External
communications and internal, or intra-ATF, communications.
External communications consists of communications between the
ATF and higher or adjacent headquarters and units. Internal ATF
communications consists of ship-to-ship communications between
ships of the ATF (along with embarked landing force elements);
and ship-to-shore communications between ATF ships and landing
force elements (when phased ashore).

Operations Desert Shield and Desert Storm reinforced the
requirement for modernizing both external and internal amphibious
communications capabilities. For example, Air Tasking Orders
(ATOs) transmitted by the Joint Forces Air Component Commander
(JFACC) in Riyadh during the Gulf War often took up to 12 hours
to be received by Navy ships at sea, due to antiquated shipboard
equipment, the lack of high-data-rate shipboard communications
pipes to provide connectivity to forces ashore, and system
incompatibilities.[1] Intelligence and battle damage assessment

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[1]David Foxwell and Mark Hewish, "Naval Communications: Robust,
Reliable, Secure," <u>International Defense Review</u>, December 1991, p.
1338.

imagery was often not available to afloat units, or had to be
flown out to the ships, because of the lack of high-data-rate
communications pipes.[2] Once on-board a ship of the ATF, further
dissemination to other ships normally required delivery by
helicopter.

Communications shortfalls such as these greatly accelerated
the introduction of Super High Frequency (SHF) SATCOM systems on
amphibious flagships to provide the high volume information
transfer capability necessary to interface with the increasing
number of automated command and control (C^2) and intelligence
systems.[3] While the introduction of shipboard SHF primarily
improved external communications, as it was only installed on
amphibious flagships, it forever altered the way amphibious
forces viewed the processes of operational planning and command
and control.

Today, the Commander, Amphibious Task Force (CATF) and
Commander, Landing Force (CLF) have access via UHF and SHF SATCOM
to automated systems which provide vast quantities of
intelligence, sensor data, tactical decision-making aides, and
information management tools to assist them in their decision-
making process. This information is vital because "improved
technology in mobility, weapons, sensors, and C^4 systems

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[2]"Fleet Data Links Enhanced by New Architecture, Gear,"
Signal, November 1992, pp. 32-33.

[3]Christopher J. Bushnell, "U.S. Navy SHF Satcom: Past, Present
and Future," Unpublished Thesis, U.S. Naval Postgraduate School,
Monterey, CA: June 1994, p. 1.

continues to reduce the factors of time and space causing faster

tempos of operations."[4] Faster operational tempos necessitate

faster decision cycles to effectively command and control forces

under these conditions. The need for faster decision cycles in

amphibious warfare is further exacerbated by the emerging

doctrine of operational maneuver from the sea (OMFTS).

> "Maneuver warfare, applied to operational maneuver from the
> sea..., implements the basic principles of tactical mobility,
> operational speed, and flexibility at extended distances.
> Increased operational complexity, compressed time and space, and
> rapidly changing situations drive the commander's decision
> cycle."[5]

In order to facilitate faster decision cycles and effectively

command and control high tempo amphibious operations, the

amphibious commander needs

> "a fused real time, true representation of the battlespace--
> an ability to order, respond and coordinate horizontally and
> vertically to the degree necessary to prosecute his or her
> mission in that battlespace."[6]

While SHF SATCOM has given the CATF and CLF embarked on the

amphibious flagship greatly improved external communications

connectivity to theater and national organizations and systems,

this does not mean that they now have true battlespace

situational awareness as called for by the Joint Chiefs of Staff

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[4]Department of Defense, The Joint Staff, <u>Doctrine for Command,
Control, Communications, and Computer (C[4]) Systems Support to Joint
Operations</u>, Joint Pub 6-0 (Washington: 3 June 1992), p. I-1.

[5]<u>FMFM 3</u>, quoted in John R. Thomas, "A Hedge Against
Uncertainty: Using Command, Control, Communications, and Computer
(C[4]) Technology on the Battlefield." Unpublished Research Paper,
U.S. Naval War College, Newport, RI: 17 May 1993, p. 8.

[6]Department of Defense, The Joint Staff, <u>C4I for the Warrior</u>
(Washington: 12 June 1993), p. 4.

in C4I For The Warrior. The global C4I system envisioned to provide seamless C4I to the warfighter and facilitate battlespace situational awareness has been articulated in that document and in Copernicus, which is the Navy's vision of the future of C4I support for war fighters. In Fact, a great deal of progress towards the visions contained in these complementary documents has been made. Significant financial resources have been obligated to increase joint interoperability and develop over-arching hardware/software systems such as the Naval Tactical Command System-Afloat (NTCS-A) and its soon-to-be successor, the Joint Maritime Command Information System (JMCIS). "JMCIS is the "set of standards" for integrating a diverse array of shipboard and shore based C^2, cryptographic, intelligence, logistical, and mission-planning systems."[7] Systems such as JMCIS will, in the not too distant future, facilitate the fusion of data from all other approved joint C4I systems. When this fusion is realized, the CATF and CLF will possess the common tactical picture of the battlespace necessary for them to effectively prosecute amphibious operations in today's "high-tech" threat environment.

But in our haste to realize these lofty goals, we focused primarily on the high visibility, high payoff systems that serve the military and naval establishments at-large, and particularly the higher echelons of command. Vice Admiral Cebrowski, the Navy's Director of Space and Electronic Warfare (N6), recently

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[7]"Navy Drives Development for Joint Command-Control "Vision"," Sea Power August 1994. p. 25.

stated that

> "The Navy must balance C4I investments between shooters and commanders. We initially focused our Copernicus architecture on providing "C4I for the admiral." With the increase in sophistication of both our weapons systems and our operators, we must enable our shooters to reap the benefits of our technological edge."[8]

Unfortunately, post-Cold War fiscal constraints have resulted in intense competition for scarce modernization dollars. Even with the "fundamental shift in strategic direction away from open-ocean warfighting on the sea toward joint operations conducted from the sea,"[9] articulated by the Secretary of the Navy in ...From the Sea, support for communications upgrades to amphibious ships to improve internal ATF communications has been weak. So while a common tactical picture may soon be a reality for the CATF and CLF on the amphibious flagship, those embarked on less C4I capable ships of the ATF, and landing force elements phased ashore during amphibious operations will not have a common tactical picture. Unless, that is, unless we provide our amphibious ships with a high-data-rate communications pipe capable of exchanging the high volumes of information necessary to ensure that the entire ATF has continuous battlespace situational awareness. Until we provide the landing force and every ship of the ATF with a robust, reliable, high volume multi-media (voice, video, imagery, and data) information transfer

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[8]Arthur K. Cebrowski, "Address Before Tidewater Mini-Symposium on Naval Aviation," Naval Engineers Journal, November 1994, p. 19.

[9]Sean O'Keefe and others, "...From the Sea," U.S. Naval Institute Proceedings, November 1993, p. 2.

capability, we will be unable to maximize our ability to command
and control and prosecute amphibious operations effectively
"...From the Sea."

Current shipboard communications systems will not support
high volume intra-ATF information transfer. On all but the
amphibious flagship, current shipboard capabilities are limited
to Ultra-High-Frequency (UHF) satellite and single-channel
terrestrial (non-satellite) radio circuits in the UHF, Very-High-
Frequency (VHF) and High-Frequency (HF) bands. None of these
circuits are capable of handling the high-data-rates necessary
for us to reach our goal.

IGNORING THE PROBLEM WON'T WORK ANYMORE

We cannot ignore our shortfall in ship-to-ship and ship-to-
shore intra-ATF communications any longer. Aside from the
requirement for battlespace situational awareness at all echelons
of the ATF that I discussed earlier, there are several emerging
issues that make providing a high-data-rate communications
capability imperative.

Since ...From The Sea was published in September of 1992, the
Navy-Marine Team has worked diligently at making their respective
automated command and control, computer, and intelligence systems
compatible. Systems such as the Marine Corps' Intelligence
Analysis System (IAS), which provides embarked Marine units with
access to intelligence databases worldwide via the flagship's SHF
SATCOM high-data-rate communications pipe, will soon be included

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under the NTCS-A/JMCIS umbrella.[10] Marine units embarking on
amphibious ships will be able to use the same intelligence
databases afloat that they use in garrison. They will be able to
sit at one NTCS-A computer terminal in the Landing Force
Operations Center (LFOC) and access multiple command and control,
logistics, intelligence and mission-planning systems.

But with increased compatibility and ease of use comes
additional reliance on automated systems to support command and
control and operational decision-making. These systems are, of
course, of great benefit to commanders at all echelons, and their
use poses no problem provided communications pipes are available
to provide access to systems and databases that are not
physically located on the ship itself. For instance, the joint
standard for dissemination of Air Tasking Orders (ATO) is the
soon-to-be JMCIS-compatible Air Force Contingency Tactical Air
Control System (TACS) Automated Planning System (CTAPS).[11] A
JFACC generated ATO can be received at a shipboard CTAPS terminal
aboard the amphibious flagship which is connected to the JFACC
ashore via the ship's SHF SATCOM system. But if you are a
landing force battalion commander embarked on a ship other than
the SHF-equipped flagship, or you are phased ashore during the
early stages of an amphibious assault, you do not have the
communications connectivity necessary to do this. If you want

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[10]"Navy Drives Development for Joint Command-Control "Vision","
p. 25.

[11]Ibid, p. 26.

the ATO in a timely manner, you may well have to have a copy
couriered by helicopter from the flagship.

A second issue is the continuing decline in amphibious lift
capacity which is anticipated to continue through Fiscal Year
1999.[12]   Less amphibious ships make it more likely that
commanders and staffs of subordinate elements of the MAGTF will
be embarked on ships other than the flagship. Battalion and
Service Support Group commanders require access to many of the
same automated systems that are currently available only on the
flagship. Furthermore, to plan efficiently, high-data-rate ship-
to-ship communications is necessary for exchanging planning
documents, intelligence products, and items such as remotely
piloted vehicle (RPV) imagery. This will become even more vital
as we implement our doctrine of Operational Maneuver From The
Sea. OMFTS and its attendant concept of the over-the-horizon
amphibious assault (OTH-A) will lend flexibility to the landing
plan that will

> "enable the CATF and CLF to gain and retain the tactical
> initiative, enhance operational flexibility, take advantage of
> enemy force dispositions and/or weaknesses, and employ the
> element of surprise to the maximum extent."[13]

However, this doctrine will also make it imperative that CATF,
CLF, and their subordinate commanders can rapidly exchange

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[12]Department of the Navy, Headquarters, U.S. Marine Corps, <u>Top-
Level School Reference Papers 1994/1995</u> (Washington: 15 July 1994),
p. 175.

[13]Charles R. Saffell, "Over-the-horizon Amphibious Battlespace
Situational Awareness," Unpublished Research Paper, U.S. Naval War
College, Newport, RI: 1993, p. 5.

information since OMFTS allows for rapidly changing the landing plan as the tactical situation dictates. Furthermore, the installation of fiber optic Local Area Networks (LANs) on amphibious ships will provide embarked staffs with the ability to process and transfer huge amounts of data.[14] Only a high capacity communications pipe is necessary to link each of the ships' LANs into one network.

Once the amphibious assault begins, the forward command elements of the MAGTF, the ground combat element and the service support group on the beach lose access to the automated systems and databases that provided them with the situational awareness and decision-making tools. In an amphibious raid scenario this may be acceptable, but in the case of an amphibious assault to enable the introduction of heavier follow-on forces, headquarters will also phase ashore. These staffs require continued access to automated systems to effectively conduct ground operations. Unfortunately, these forces must rely largely on single-channel ship-to-shore voice circuits until Marine Corps' Ground Mobile Force (GMF) SHF SATCOM terminals are brought ashore and installed. GMF SATCOM terminals are large, bulky, and usually require a 5-ton truck for transportation. Because the terminals are critical low-density items and are difficult to replace if destroyed, they are not normally brought ashore until the tactical situation is sufficiently stable as to minimize the

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[14]Department of the Navy, Director, Space and Electronic Warfare, Copernicus (Washington: 1991), p. 23.

threat from hostile fire. Despite the manufacturer's claim that the terminals are designed to provide full communications capability within 20 minutes of arrival on site,#12 in reality, it may take several hours before the SHF SATCOM link is installed and terminal instruments such as computers and secure telephones are fully operational. Once the GMF SATCOM terminal is established ashore, a separate high capacity link direct to the afloat SHF-equipped ship is highly desirable as an alternate communications path for both the ship and the shore sites should either's SHF SATCOM terminal become an equipment casualty.

A ground combat commander ashore and the MAGTF commander afloat must view the same common tactical picture if they are to interface effectively. The ATO must be available to the war fighter ashore it is meant to support. The combat service support element commander on the beach must have access to the current status of the offload of troops and equipment,as well as the location of urgently needed supplies. Shipboard systems can provide them with this information, when they need it. We need only decide to give them the means of accessing those systems. So what is the answer?

SATELLITE COMMUNICATIONS AND TERRESTRIAL MULTICHANNEL RADIO

While space-based satellite communications systems continue to fulfill a growing share of the Navy's communications requirements, I believe it is unwise to assume that sufficient SATCOM resources will always be available to the CATF and CLF to support their intra-ATF high-data-rate communications

requirements. While the ATF will use the SATCOM resources allocated to it to the maximum extent possible, what the CATF/CLF needs is a system under their control. A system that will be there when they need it, with the throughput they require. In short, a terrestrial (non-satellite) multichannel radio system.

Multichannel radio uses multiplexing technology to transmit several circuits over one transmission path at the same time. Recent advances in multichannel technology make it a reliable option for providing high volume information transfer between ships and units separated by extended line-of-sight distances. For example, testing of a shipboard variant of a Marine Corps UHF multichannel system on Atlantic Fleet amphibious ships during Ocean Venture 1994 resulted in highly reliable ship-to-ship and ship-to-shore communications at distances of 25 nautical miles.[15] The radio links were maintained and multi-media information exchange of voice, data, and video was achieved while the ships maneuvered in relation to each other and the beach. Additional testing is necessary to determine the full range of system capabilities and applications, but the concept is promising. Another, similarly capable UHF multichannel radio system is marketed by Marconi Radio Corporation. The Marconi system is compatible with both the Marine Corps multichannel radio system and Army and Air Force communications systems.[16]

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[15]Telephone conversation with Paul Cole, Amphibious Communications Officer, Staff of Commander, Naval Surface Force, U.S. Atlantic Fleet, Norfolk, VA, 7 February 1995.

[16]Ibid., 7 February 1994.

Separate studies conducted in 1991 by the Naval Ocean Systems Center in San Diego indicate that the performance of a non-satellite SHF ship-to-ship communications link also holds promise, though this program is still at the conceptual stage and would require systems engineering and development.[17]

The point is that current multichannel radio technology makes this a realistic option. While multichannel radio has limitations in terms of range, in conjunction with SATCOM systems, it can provide the solution we seek.

Why not just rely on SATCOM? It would be unwise for several reasons. They are as follows:

1. Military satellite communications (MILSATCOM) constellations have limited capacity that must be divided between an increasing number of users who have rapidly increasing throughput requirements. In 1993, the MILSATCOM Systems Office of the Defense Information Systems Agency (DISA) studied the capability of current and programmed Department of Defense (DOD) satellite assets to handle DOD user requirements under peacetime and major regional conflict scenarios. They found that none of the DOD satellite systems could satisfy user requirements even after migrating 50% of candidate requirements to terrestrial fiber optic lines.[18] In fact, the military is not even sure where information throughput requirements will top out. Rear

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[17]Department of the Navy, Naval Ocean Systems Center, Battle Group Alternative Communications; A Study of the SHF Non-Satellite Communications Channel (San Diego, CA: 31 December 1991), p. 42.

[18]Bushnell, p. 78.

Admiral Felton, head of the Navy's Space and Electronic Warfare Systems Communications Directorate, states "We don't know what the upper boundary of the requirement (for data) is. We only know that we need more of it."[19]

Tactical communications requirement for intra-ATF communications is likely to be a low priority under most scenarios compared to higher echelon theater and national requirements. Because the CATF does not control satellite constellation resources, he can never be assured that he will be allocated sufficient satcom resources for his intra-ATF needs.

2. Constrained defense budgets makes currently programmed SATCOM constellation and shipboard terminal procurement uncertain. For example, the MILSTAR EHF program originally called for a constellation of 10 satellites, but it was later reduced to two satellites.[20] Installation of the lightweight AN/WSC-6(V)2 SHF terminal was programmed for installation on all amphibious ship classes, but LPD and LSD ship classes are no longer scheduled to receive them.[21] Obviously there is also cost associated with procuring a multichannel radio system. While I did not include a cost-benefit analysis of potential costs due to limitations in paper scope, multichannel radio appears to be a

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[19]William G. Clapp, <u>Space Fundamentals for the War Fighter</u> (Newport, RI: Naval War College Center for Naval Warfare Studies: 31 May 1994), p. 33.

[20]Ibid., p. 33.

[21]Edward J. Walsh, "Navy Aims at Joint Operations and Economies for C4I," <u>Sea Power</u> April 1994, p. 51.

cost-effective means of providing high-capacity connectivity.

3. In recognition of limited MILSATCOM capacity, the Navy is increasing its use of commercial SATCOM systems to augment MILSATCOM.[22] But commercial satellite usage raises important questions about interoperability, security, rights of usage, and laws of space.[23] Moreover, Commercial SATCOM usage costs make it impractical for long-term leasing of high-data-rate SATCOM channels to support lower-echelon amphibious tactical commanders. Current Navy contracts with the International Maritime Satellite Organization (INMARSAT) call for $6.25 per minute cost just for providing low-data-rate ship-to-shore telephone service.[24]

4. Even if funds are allocated for shipboard SHF SATCOM terminals on all amphibious ships, UHF and SHF SATCOM remain highly susceptible to defeat by fairly simple jamming systems.[25]

But our solution is not an either or situation. Neither SATCOM nor multichannel radio communications are a panacea. Each have limitations. I have listed some of the limitations of SATCOM above. The major limitation of Multichannel radio is range. But a multichannel radio system that can provide effective high capacity communications to the elements of the ATF at ranges of over 25 miles will go a long way towards bridging

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[22]Ibid., p. 54.

[23]Department of the Army, Army Enterprise Strategy: The Vision (Washington: July 1993), pp. 16-17.

[24]Bushnell, p. 89.

[25]National Security Industrial Association, Communications for Future OTH Amphibious Operations (Washington: April 1988), p. 3-39.

the gap between current intra-ATF communication capabilities and
requirements. With proper communications planning and a network
communications management system such as the Navy's new
Communications Support System, multichannel radio, and satellite
radio circuits can be used to complement each other. Information
can be automatically priority routed between task force units
over multichannel radio paths whenever units are in range. This
would minimize the use of SATCOM channels, and have a favorable
effect on theater SATCOM usage by freeing satellite throughput
for use by other units.

CONCLUSION

The rapidly increasing pace and complexity of amphibious
warfare resulting from advances in weapons and information
technology, mobility and the developing doctrine of Operational
Maneuver From The Sea, necessitate that we bridge the "gap"
between intra-ATF communications capabilities and requirements.
New multichannel radio technologies can make the vision of task
force-wide battlespace situational awareness and effective
command and control a reality. Failure to do so will risk our
ability to successfully conduct amphibious operations today and
in the future.

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